

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
2 December 2004 (02.12.2004)

PCT

(10) International Publication Number
WO 2004/104394 A1

(51) International Patent Classification⁷: **F02D 41/00**

(21) International Application Number:
PCT/JP2004/006202

(22) International Filing Date: 28 April 2004 (28.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2003-146101 23 May 2003 (23.05.2003) JP
2003-418590 16 December 2003 (16.12.2003) JP

(71) Applicant (for all designated States except US): **TOYOTA JIDOSHA KABUSHIKI KAISHA [JP/JP]**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP).

(72) Inventors; and

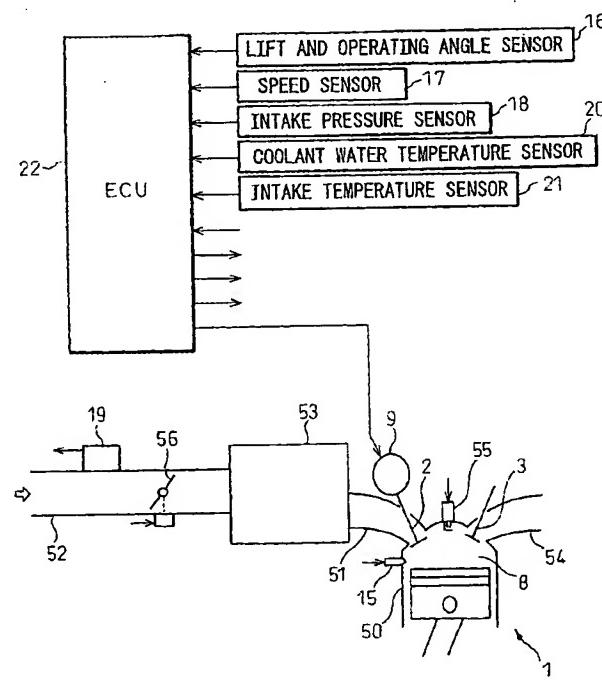
(75) Inventors/Applicants (for US only): **TSUNOOKA,**

Tukashi [JP/JP]; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **HIRAKU, Keizo [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **NAKASAKA, Yukihiro [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **HASHIZUME, Akira [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **KANAI, Hiroshi [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **FUWA, Naohide [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP). **KAGA, Tomoyuki [JP/JP]**; c/o **TOYOTA JIDOSHA KABUSHIKI KAISHA**, 1, Toyotacho, Toyota-shi, Aichi, 4718571 (JP).

(74) Agents: **AOKI, Atsushi et al.; A. AOKI, ISHIDA & ASSOCIATES**, Toranomon 37 Mori Bldg., 5-1, Toranomon 3-chome, Minato-ku, Tokyo 1058423 (JP).

[Continued on next page]

(54) Title: CONTROL DEVICE FOR MULTICYLINDER INTERNAL COMBUSTION ENGINE



WO 2004/104394 A1

(57) Abstract: A control device of a multicylinder internal combustion engine (1) provided with a valve operating characteristic control means (9) for controlling a valve operating characteristic of at least one of an intake valve (2) and exhaust valve (3), which estimates an intake difference of cylinders and limits a control range of said valve operating characteristic in accordance with said estimated intake difference.



- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SB, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP2004/006202

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02D41/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 390 041 B2 (HARA SEINOSUKE ET AL) 21 May 2002 (2002-05-21) column 6, line 50 -column 8, line 34; figures 11,12	1
A	EP 0 643 201 A (TOYOTA MOTOR CO LTD) 15 March 1995 (1995-03-15) column 11, line 12 -column 12, line 38; figures 5,6	2-13
A	EP 0 881 363 A (BAYERISCHE MOTOREN WERKE AG) 2 December 1998 (1998-12-02) the whole document	1-13 1,2,6, 8-11
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *&* document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the International search report
26 August 2004	02/09/2004

Name and mailing address of the ISA
European Patent Office, P.B. 5815 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Aign, T

INTERNATIONAL SEARCH REPORTInternational Application No
PCT/JP2004/006202

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) & JP 10 148141 A (TOYOTA MOTOR CORP), 2 June 1998 (1998-06-02) abstract -----	1

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP2004/006202	
---	--

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 6390041	B2	21-06-2001	JP 2001173469 A DE 10063997 A1 US 2001003973 A1	26-06-2001 12-07-2001 21-06-2001
EP 0643201	A	15-03-1995	JP 7077073 A DE 69410369 D1 DE 69410369 T2 EP 0643201 A1 US 5494008 A	20-03-1995 25-06-1998 29-10-1998 15-03-1995 27-02-1996
EP 0881363	A	02-12-1998	DE 19722187 A1 DE 59802874 D1 EP 0881363 A1 ES 2170432 T3	03-12-1998 14-03-2002 02-12-1998 01-08-2002
JP 10148141	A	02-06-1998	NONE	

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP2004/006202

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02D41/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 390 041 B2 (HARA SEINOSUKE ET AL) 21 May 2002 (2002-05-21) column 6, line 50 -column 8, line 34; figures 11,12	1
A	EP 0 643 201 A (TOYOTA MOTOR CO LTD) 15 March 1995 (1995-03-15) column 11, line 12 -column 12, line 38; figures 5,6	2-13
A	EP 0 881 363 A (BAYERISCHE MOTOREN WERKE AG) 2 December 1998 (1998-12-02) the whole document	1-13
		1,2,6, 8-11
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

26 August 2004

Date of mailing of the international search report

02/09/2004

Name and mailing address of the ISA
European Patent Office, P.B. 5618 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl
Fax: (+31-70) 340-3016

Authorized officer

Aign, T

INTERNATIONAL SEARCH REPORTInternational Application No
PCT/JP2004/006202

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) & JP 10 148141 A (TOYOTA MOTOR CORP), 2 June 1998 (1998-06-02) abstract -----	1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP2004/006202

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 6390041	B2	21-06-2001	JP DE US	2001173469 A 10063997 A1 2001003973 A1	26-06-2001 12-07-2001 21-06-2001
EP 0643201	A	15-03-1995	JP DE DE EP US	7077073 A 69410369 D1 69410369 T2 0643201 A1 5494008 A	20-03-1995 25-06-1998 29-10-1998 15-03-1995 27-02-1996
EP 0881363	A	02-12-1998	DE DE EP ES	19722187 A1 59802874 D1 0881363 A1 2170432 T3	03-12-1998 14-03-2002 02-12-1998 01-08-2002
JP 10148141	A	02-06-1998		NONE	